MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : CE-704B

PUID : 07231 (To be mentioned in the main answer script)

HYDRAULIC STRUCTURES

Time Allotted : 3 Hours | *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

   i) Silt extractors are constructed on

      a) bed of the river

      b) bed of the off-taking canal

      c) none of these.

ii) The minimum thickness (t) of the downstream floor, as required in the design of weirs, can be expressed by the equation

a) $h / (G + 1)$

b) $h / (G - 1)$

c) $(h - 1) / (G - 1)$

d) $(1{\cdot}33\ h) / (G - 1)$

iii) A cross drainage work is termed as a syphon if it carries the canal

a) above the drainage with the drainage flowing under pressure

b) below the drainage with the canal flowing under pressure

c) below the drainage with the canal flowing at atmospheric pressure under the works

d) above the drainage with the drainage flowing at atmospheric pressure under the works.

iv) The 'Safety Valve' of a dam is its

a) drainage gallery b) inspection gallery

c) spillway d) outlet sluices.

v) Afflux is the rise in the maximum flood level

a) upstream of the weir

b) downstream of the weir

c) both upstream and downstream of the weir

d) none of these.

vi) A spillway can be located

a) within the body of dam

b) at one end of the dam

c) entirely away from the dam

d) all of these.

vii) Factor of safety against overturning should be

a) less than 1·5 b) greater than 1·5

c) within 3 - 5 d) within 1·3 - 1·5.

viii) The provision of drainage gallery in a gravity dam helps in reducing

a) uplift pressure b) water pressure

c) silt pressure d) none of these.

ix) According to Khosla to keep the structure safe against piping exit gradient to be provided lies between

a) 0·10 and 0·15 b) 0·15 and 0·20

c) 0·20 and 0·25 d) 0·25 and 0·30.

x) An arch dam is constructed with

a) earth b) concrete

c) boulder d) none of these.

xi) A Cross Regulator controls the supply of the

a) off-taking channel b) parent channel

c) both (a) and (b) d) none of these.

xii) The self weight of a gravity dam

a) favours stability b) causes overturning

c) causes sliding d) causes uplift.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. Explain the differences between aqueduct and super-passage with neat sketch.

3. Explain how water seeping below the body of a hydraulic structure can cause its failure by (i) piping, (ii) direct uplift. $2\frac{1}{2} + 2\frac{1}{2}$

4. Explain Bligh's Creep theory in brief.

5. a) On which consideration is the Gravity Dam classified to high and low.

b) What is the limiting height of a low concrete gravity dam constructed in concrete of strength 3000 kN/sq.m ? 2 + 3

6. Derive the designed seepage discharge per unit width of an earthen dam. http://www.makaut.com.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) Why no reinforcement is used in concrete gravity dam ? 2

b) The dimensions of the section of a non-overflow concrete gravity dam are given below :

i) RL of top of dam 189·0 m

ii) RL of HFL in upstream 185·0 m

iii) Width of top of the dam 6·0 m

iv) RL of the deepest bed level in upstream and downstream 105·0 m

v) RL of tail water 111·0 m

Neglecting the earthquake forces calculate maximum vertical stresses at the hill and toe of the dam. 13

8. a) Describe trapezoidal notch fall with a neat sketch. 3

   b) Design the salient dimensions of a siphon well drop for the following particulars :

      i) fall 4·0 m

      ii) ground level 163·0

      iii) full supply depth 75·0 cm

      iv) u/s bed level 162·0 m

      v) discharge 1·0 cumec

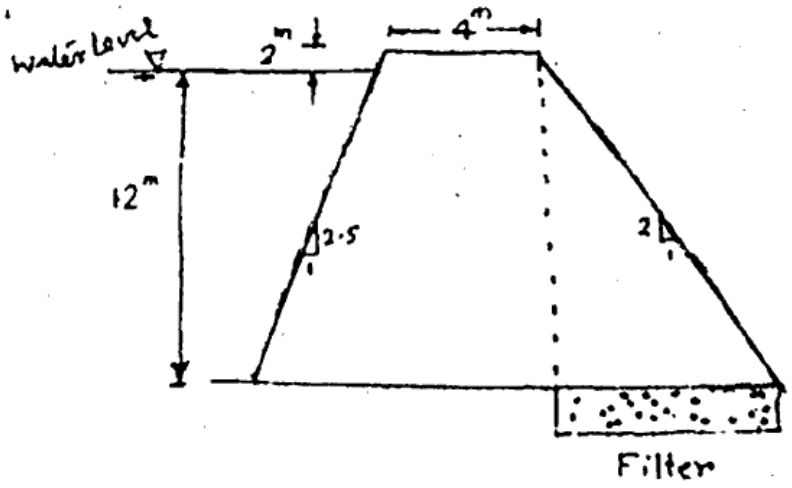
      vi) bed width in u/s and d/s 2·4 m. 12

9. Describe the layout of a diversion head work and its components with a neat sketch and mention the functions of each component in brief.

10. a) State briefly different types of failure of Earthen Dam and their remedies. 5

    b) A section of a homogeneous Earthen Dam is shown in the following figure. Calculate the seepage discharge per metre length through the body of the dam. 10

$K = 8 \times 10^{-5}$ m/sec



11. a) What is a canal fall ? 2

b) What are the factors on which the location of a canal depends ? 4

c) Describe the various types of falls in brief with neat sketch. 9